

Report on Discussion on Non-Deterministic Models/Code

Questions:

When the model/code is non-deterministic (for example, when model output comes from a random simulation, or from a statistical model),

1. does the treatment of SA/UA need to change from that used in the deterministic case?

and
2. are there any special considerations?

Points made in discussion:

Similarities with the deterministic case:

1. It was suggested that the problem in the non-deterministic case still fell within the general scope of parameter uncertainty considered earlier. This view was not challenged, but not agreed either.
2. There was agreement that UA would go through in the same way as for deterministic models: simulated values go in and a distribution of outputs comes out.
3. If the output from the code is summarized in terms of non-random quantities such as means, covariances or complementary cdf's then the usual SA methods apply.

Cautions:

4. If the model is stochastic, initialization may need care. (Example: in Givens & Punt's modelling of whale populations, initialization was easy for deterministic models but hard when numbers of births were allowed to be stochastic.)
5. Introduction of randomness into a deterministic model may make a big difference to results (examples: game theory models, epidemic models).

Opportunities:

6. Standard simulation tricks such as use of antithetic variables, control variables etc could be useful.
7. Standard Design of Experiments ideas could apply to choice of model inputs.
8. Incorporating a non-zero nugget effect is a straightforward extension to Kriging or Bayesian Gaussian process methods when building emulators.